Primary care physicians routinely see patients with chronic respiratory diseases, such as asthma and chronic obstructive pulmonary disease (COPD). Although treatment guidelines are available, we still need practical information that translates guidelines and other evidence into diagnosing and managing these diseases. Each issue in the *Pulmonary Practice Pearls for Primary Care Physicians* eNewsletter series will focus on a key topic in the management of COPD or asthma within the context of current national guidelines and clinical practice. Topics will be brought to life through the presentation of hypothetical clinical cases, and an emphasis will be placed on applying key learnings to clinical practice. Practice tools and links to additional information will be featured in each issue.

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**Diagnosis of Chronic Obstructive Pulmonary Disease: Focus on Spirometry and Clinical History**

Approximately 12.1 million adults in the United States have been diagnosed with chronic obstructive pulmonary disease (COPD), which is the third leading cause of death in the United States. COPD is characterized by progressive airflow limitation that is not fully reversible, with narrowing of the small airways and destruction of the lung parenchyma, caused by an abnormal inflammatory response to tobacco smoke or other noxious particles.

Significant extrapulmonary effects may contribute to disease severity in some patients. Extrapulmonary effects and morbidities associated with COPD are described in detail in the first newsletter in this series. Pharmacologic treatments and pulmonary rehabilitation can improve functional capacity and quality of life of patients with diagnosed COPD; however, without a diagnosis, these therapies and the opportunity for improvements do not exist.

**In Whom Should a Diagnosis of COPD Be Considered?**

Patients aged ≥40 years with respiratory symptoms and a history of exposure to risk factors (eg, tobacco smoke) may have COPD. Although not diagnostic themselves, the presence of multiple key indicators of COPD may be used to gauge the likelihood of a COPD diagnosis. The United States Preventive Services Task Force and the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines note that spirometry is indicated as a diagnostic test for COPD and other pulmonary diseases for patients with symptoms suggestive of COPD, including chronic cough, increased sputum production, wheezing, and dyspnea. Information on key indicators identified by other groups is available in the first newsletter in this series. Additional information on screening tools, including questionnaires and pocket spirometers, is available in the second newsletter in this series.
Cases

It's just one of those days in your office—a busy preholiday morning during the cold and flu season rush. You have 2 patients complaining of shortness of breath scheduled for morning appointments.

Mary is a 60 year old who retired from a bakery 2 months ago because her legs “gave out.” She noted shortness of breath 3 months ago when her son came to visit. He remarked on her inability to walk up to the second floor of her house without stopping to rest. Mary believes her breathlessness may have become worse in the past 2 weeks. She has trouble sleeping at night and says her ankles are still swollen from years of standing on hard floors in the bakery. She has gained 8 pounds since she stopped working; she says she may be eating more, and she does not exercise regularly. She does not have chest pain or leg pain with walking, but her joints have been aching in the morning and at night for several years. Her hypertension remains under acceptable control with dual therapy.

Charles is a 67 year old with a long history of heart disease, with a previous myocardial infarction (MI) 4 years ago and a 40–pack-year smoking history. Charles quit smoking cigarettes after his MI and now smokes a cigar each evening. Today he complains of shortness of breath and some wheezing at night. He can’t walk up his 4 front steps without stopping to catch his breath. He has no cough, fever, or leg pain. He has been taking a beta-blocker since his MI, but he says shortness of breath has not been a real problem until the last month or two. He has done less since his MI, because his wife worries if he does too much. He did not have cardiac rehabilitation after his MI.

Both of these patients have shortness of breath and risk factors for COPD and cardiovascular disease (CVD)—for Mary, long-term exposure to inhalation of flour in the bakery (COPD) and hypertension (CVD), and for Charles, a 40–pack-year smoking history (COPD and CVD). The differential diagnoses should include COPD as well as CVD. Both patients should have diagnostic spirometry as well as evaluation for CVD.

Note: These are hypothetical case descriptions for teaching purposes.
capacity (FVC) <0.70, indicates COPD (BOX). A ratio of 0.70 may result in underdiagnosis of COPD in patients <45 years old and overdiagnosis in the elderly. Using the lower limit of normal values for FEV1/FVC, which classifies the bottom 5% of the healthy population as having abnormal airflow based on normal distribution, may help minimize potential misclassifications in the younger and oldest populations. The severity of COPD is reflected by the degree of airflow abnormality and is based on the postbronchodilator FEV1 percent of predicted value (see FIGURE 1 in the first newsletter in this series).

Chest radiograph, computed tomography (CT), and physical examination may help to exclude other diagnoses (TABLE 2), but should not be the primary tests used to confirm a COPD diagnosis. In particular, a chest radiograph is valuable in excluding the presence of cardiac failure and lung masses, particularly in patients with significant smoking histories. Comorbid conditions and other complications of COPD may be identified during physical examination. Current guidelines do not recommend routine CT of the chest, although this technique may help identify the extent and distribution of emphysema. High-resolution CT continues to be studied as a diagnostic tool to identify subtypes of COPD, especially emphysema, but these tests are expensive and warrant further evaluation of their cost-benefit ratio. The GOLD guidelines recommend that white patients who develop COPD at <45 years of age should be screened for alpha-1 antitrypsin deficiency with serologic testing; however, screening should be considered for all patients diagnosed with COPD. Alpha-1 antitrypsin deficiency test kits may be obtained at no cost through the Alpha-1 Foundation, the Alpha One International Registry, and other organizations.

**Cases: Diagnoses**

**Mary:** On physical examination, you find that she has blood pressure of 140/88 mm Hg, a pulse of 84 beats per minute, and 24 respirations per minute after sitting for 5 minutes. She has no signs of an upper respiratory infection or jugular-venous distention. Her chest sounds are quiet with no wheezing, but she breathes through pursed lips after climbing up onto the examination table. There are no masses in her abdomen, and the liver edge is not palpable. Mary does have large varicose veins on her legs and 2+ edema. A chest radiograph shows a cardiac outline within normal limits and no infiltrates, masses, or enlarged nodes. You do find a large translucent area in the right upper lobe of Mary’s lung. Electrocardiogram findings are within normal limits, except for those consistent with right heart strain. You proceed to spirometry: Mary has a postbronchodilator FEV1 of 2.0 L (54% of predicted), an FVC of 2.0 L (76% of predicted), and an FEV1/FVC of 0.67.

You diagnose Mary with moderate COPD (GOLD stage II). Mary’s long work history at a bakery, with chronic exposure to flour, is the likely etiology of her COPD because she has no history of primary or secondhand exposure to tobacco or other smoke.

**Charles:** Besides evidence of the previous anterior MI, Charles’ electrocardiogram shows no changes from the last one he had 1 year ago. A chest radiograph does not show cardiac enlargement, a flattened diaphragm, or infiltrates; as always, the radiologist comments that “clinical correlation is advised.” You proceed to spirometry and find that Charles has an FEV1 of 1.6 L (45% of predicted), an FVC of 2.5 L (60% of predicted), and an FEV1/FVC of 0.64. His postbronchodilator FEV1/FVC of 0.65 is basically unchanged. Based on his history (which includes 40 pack-years of smoking), physical examination, and spirometry and electrocardiogram findings, you make a
diagnosis of severe COPD (GOLD stage III). It is likely that a spirometry assessment done at the time of follow-up from his MI would have diagnosed the coexistence of CVD and COPD several years earlier, allowing for better planning of his therapy.

Note: These are hypothetical case descriptions for teaching purposes.

Caveats in Making a Diagnosis

The differential diagnosis for COPD includes asthma and other respiratory as well as cardiovascular diseases (TABLE 3). Congestive heart failure may be distinguished from COPD with physical examination, chest radiograph, pulmonary function tests, and laboratory tests; however, the diseases may coexist in 10% to 46% of elderly patients with confirmed or suspected COPD. COPD shares common symptoms with many airway diseases (eg, dyspnea, cough, limitation of normal activities). When considering a diagnosis of COPD, a smoking history of ≥20 pack-years has been shown to be a strong predictor of airway obstruction. Smoking also is a significant risk factor for congestive heart failure and CVD.

In particular, differentiating COPD from asthma can be challenging because these diseases have many overlapping features. Differentiation may be particularly difficult in the elderly, smokers, and patients with a long history of asthma. Patients with severe treatment-resistant (formerly called “refractory”) asthma can have persistent patterns of airway obstruction (also called “fixed-airway disease”). These patients usually require the highest step of asthma treatment (eg, step 6 from current US asthma guidelines). Their treatment may include high-dose inhaled or oral corticosteroids, and they may have an incomplete response to such therapy. Their postbronchodilator spirometry may show incomplete reversibility, looking more like COPD obstruction. Asthma and COPD coexist in approximately 3 million individuals in the United States according to data from the National Health and Nutrition Examination Survey III, and may be particularly prevalent in individuals with asthma who are exposed to cigarette smoke or other noxious agents.

Although COPD is defined as airflow limitation that is not fully reversible, evidence from clinical studies suggests that patients with COPD can have a significant bronchodilator response. Bronchodilator reversibility, or responsiveness, (eg, change in FEV\textsubscript{1} or FVC ≥12% and ≥200 mL) is different from reversibility of airway obstruction (ie, change in FEV\textsubscript{1}/FVC ratio from <0.70 to ≥0.70). Bronchodilator reversibility has been shown to vary with time, and the bronchodilator used for testing, and the criteria used to assess reversibility. For this reason, bronchodilator reversibility is not recommended as a diagnostic criterion of COPD or for distinguishing asthma from COPD.

Other Considerations for Use of Spirometry to Diagnose COPD

Quality spirometric measurements are important for objective and reproducible assessment of airflow limitation. To that end, information on equipment and patient preparation and spirogram recording, evaluation, and standardization is available through GOLD and the American Thoracic Society (ATS)/European Respiratory Society Task Force. In addition, the ATS has initiated a free educational program called Pulmonary Function Testing: Collaborating for Accelerated Change, to support spirometry use and quality spirometry measurement in primary care. Through collaboration of a pulmonologist and a family physician, the program is designed to provide individual mentorship regarding interpretation and inclusion of spirometry results in the care of patients with asthma and COPD. The program is accredited by the American Academy of Family Physicians (AAFP) for 20 hours and has been added to...
the resources of the AAFP Measuring, Evaluating, and Translating Research into Care (METRIC) program for recertification by the American Board of Family Medicine (see http://www.aafp.org/online/en/home/cme/selfstudy/metric.html for more information).

Issues regarding use of spirometry in a primary care practice include cost and reimbursement. Spirometers now cost only $1000 to $2000, depending on the type purchased.37 Pocket spirometers,38 which are less expensive than standard diagnostic spirometers—many are $100 or less—can provide comparable FEV1 measurements.39 Pocket spirometers, which were reviewed in the second newsletter in this series, should be used for screening only40; diagnosis of COPD should be confirmed with pre- and postbronchodilator spirometry3 conducted according to established guidelines.41 Physicians may expect Medicare reimbursement of approximately $35 for simple spirometry and $61 for pre- and postbronchodilator spirometry, based on 2011 current procedural terminology (CPT) codes and nationwide Medicare payment information42; private insurance companies may reimburse at varying rates,42 usually higher than Medicare rates. Therefore, the cost of the spirometer is recovered quickly. Appropriate reimbursement depends on use of proper current CPT codes (TABLE 4),42 including evaluation and management (E/M) codes43 as well as ICD-9-CM codes that accurately reflect COPD symptoms and support use of spirometry (TABLE 5).44 E/M codes can be submitted using the modifier -25 code when applicable (see http://www.aafp.org/fpm/2004/1000/p21.html for additional information).

**Conclusion**

When considering a diagnosis of COPD, review of a detailed medical history can provide important information regarding symptoms, exacerbations, and multiple morbidities. Achieving confidence in a diagnosis of COPD versus CVD or asthma may be particularly difficult in primary care because of overlapping symptoms and disease characteristics. Spirometry assessment performed according to established guidelines3 is required to evaluate patients appropriately, identify additional morbidities, and exclude differential diagnoses.

**Cases: Wrap-up**

Both patients have COPD. Without spirometry, however, each could have been diagnosed inaccurately—Charles with congestive heart failure and Mary with depression or respiratory infection. Therefore, it is important to use spirometry to make a definitive diagnosis of COPD.

**Note: These are hypothetical case descriptions for teaching purposes.**

**References**

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August 3, 2011.

Table 1. Sample Checklist for Evaluating Medical History During Potential Diagnosis of COPD³

<table>
<thead>
<tr>
<th>Topic</th>
<th>Details for Discussion With Patient</th>
</tr>
</thead>
</table>
| **Exposure to risk factors**       | Smoking  
Occupational or environmental exposures                                                       |
| **Past medical history**           | Asthma  
Allergy  
Sinusitis  
Nasal polyps  
Respiratory infections in childhood  
Other respiratory diseases |
| **Family history**                 | COPD  
Other chronic respiratory diseases                                                               |
| **Pattern of symptom development** | Age at onset  
Initial symptoms of COPD may include increased breathlessness, more frequent “winter colds,” social restriction |
| **History of exacerbations or previous hospitalizations for respiratory disorder** | Periodic worsening of symptoms may not have been defined as an exacerbation of COPD |
| Presence of multiple morbidities | Heart disease  
Malignancies  
Osteoporosis  
Musculoskeletal disorders (may contribute to restriction of activity) |
|-------------------------------|---------------------------------------------------------------|
| Impact of disease on a patient’s life | Limitation of activity  
Missed work and economic impact  
Effect on family routines  
Feelings of depression or anxiety |
| Additional factors | Reducing risk factors (eg, smoking cessation)  
Social and family support available to the patient |

COPD, chronic obstructive pulmonary disease.

**Figure. Algorithm for Diagnosis of Chronic Respiratory Diseases in Primary Care**

http://newsletter.qhc.com/IFP/IFP_COPDissue3_5.htm (8 of 13) 9/15/11 1:15 PM
Focus on COPD (Issue 3)

COPD, chronic obstructive pulmonary disease.

Table 2. Additional Tests to Consider When Establishing a Diagnosis of Moderate to Very Severe COPD

<table>
<thead>
<tr>
<th>Item</th>
<th>Value in Establishing Diagnosis or Monitoring Disease Progression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung function and imaging</td>
<td></td>
</tr>
<tr>
<td>Procedure</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Bronchodilator reversibility testing</td>
<td>Excludes other diagnoses (eg, asthma)</td>
</tr>
<tr>
<td></td>
<td>Cannot predict disease progression</td>
</tr>
<tr>
<td>Chest radiograph</td>
<td>Excludes alternative diagnoses (eg, cardiac failure)</td>
</tr>
<tr>
<td></td>
<td>Establishes presence of significant multiple morbidities</td>
</tr>
<tr>
<td>CT or high-resolution CT</td>
<td>Aids in differential diagnoses</td>
</tr>
<tr>
<td><strong>Laboratory tests</strong></td>
<td></td>
</tr>
<tr>
<td>Arterial blood gas measurement</td>
<td>Assesses development of respiratory failure in patients with oxygen saturation &lt;92% based on pulse oximetry*</td>
</tr>
<tr>
<td>Hematocrit</td>
<td>Assesses anemia and polycythemia (hematocrit &gt;55%), which may develop in the presence of arterial hypoxemia, especially in continuing smokers</td>
</tr>
<tr>
<td></td>
<td>Low hematocrit in patients on long-term oxygen treatment indicates poor prognosis</td>
</tr>
<tr>
<td><strong>Function and activities</strong></td>
<td></td>
</tr>
<tr>
<td>Respiratory muscle function</td>
<td>Assesses dyspnea or hypercapnia not explained by lung function testing or when peripheral muscle weakness is suspected</td>
</tr>
<tr>
<td>Sleep studies</td>
<td>May be indicated when hypoxemia or right heart failure develops in the presence of relatively mild airflow limitation or when symptoms suggest sleep apnea</td>
</tr>
<tr>
<td>Exercise testing</td>
<td>Measures exercise capacity, primarily in conjunction with pulmonary rehabilitation programs</td>
</tr>
<tr>
<td><strong>Genetic factors</strong></td>
<td></td>
</tr>
<tr>
<td>Alpha-1 trypsin deficiency screening†</td>
<td>Indicates need for family screening or appropriate counseling</td>
</tr>
</tbody>
</table>
COPD, chronic obstructive pulmonary disease; CT, computed tomography; PaCO₂, partial pressure of carbon dioxide; PaO₂, partial pressure of oxygen.

*Defined as PaO₂ < 8.0 kPa (60 mm Hg) with or without PaCO₂ > 6.7 kPa (50 mm Hg) at sea level.
† Valuable for white patients who develop COPD at an early age (<45 years) or who have a strong family history of the disease.

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Suggestive Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>COPD</td>
<td>Onset in mid-life&lt;br&gt; Symptoms slowly progressive&lt;br&gt; Long history of tobacco smoking&lt;br&gt; Dyspnea during exercise&lt;br&gt; Largely irreversible airflow limitation</td>
</tr>
<tr>
<td>Asthma</td>
<td>Onset early in life (often childhood)&lt;br&gt; Symptoms vary from day to day&lt;br&gt; Symptoms at night/early morning&lt;br&gt; Allergy, rhinitis, and/or eczema also present&lt;br&gt; Family history of asthma&lt;br&gt; Largely reversible airflow limitation</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>Fine basilar crackles on auscultation&lt;br&gt; Chest radiograph shows dilated heart, pulmonary edema&lt;br&gt; Pulmonary function tests indicate volume restriction, not airflow limitation</td>
</tr>
<tr>
<td>Bronchiectasis</td>
<td>Large volumes of purulent sputum&lt;br&gt; Commonly associated with bacterial infection&lt;br&gt; Coarse crackles/clubbing on auscultation&lt;br&gt; Chest radiograph/CT scan shows bronchial dilation, bronchial wall thickening</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>Onset—all ages&lt;br&gt; Chest radiograph shows lung infiltrate&lt;br&gt; Microbiological confirmation&lt;br&gt; High local prevalence of tuberculosis</td>
</tr>
</tbody>
</table>
| Obliterative bronchiolitis | Onset in younger age, nonsmokers  
May have history of rheumatoid arthritis or fume exposure  
CT scan on expiration shows hypodense areas |
|---------------------------|--------------------------------------------------------------------------------------------------|
| Diffuse panbronchiolitis | Most patients are male and nonsmokers  
Almost all have chronic sinusitis  
Chest radiograph and HRCT scans show diffuse small centrilobular nodular opacities and hyperinflation |

These features tend to be characteristic of the respective diseases but do not occur in every case. For example, a person who has never smoked may develop COPD (especially in the developing world where other risk factors may be more important than cigarette smoking); asthma may develop in adult and even elderly patients.

COPD, chronic obstructive pulmonary disease; CT, computed tomography; HRCT, high-resolution computed tomography.

From the *Global Strategy for Diagnosis, Management, and Prevention of COPD*, used with permission from the Global Initiative for Chronic Obstructive Lung Disease (GOLD), [www.goldcopd.org](http://www.goldcopd.org).

| Table 4. Sample CPT Codes for Spirometry Related to Diagnosis of COPD⁴² |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Code*                   | Description                                                                                                                                                                                                                   |
| 94010                   | Spirometry, including graphic record, total and timed vital capacity, expiratory flow rate measurement(s), with or without maximal voluntary ventilation                                                                       |
| 94060                   | Bronchodilation responsiveness, spirometry as in 94010, pre- and postbronchodilator administration                                                                                                                          |
| 94375                   | Respiratory flow volume loop                                                                                                                                                                                                  |
| 94620                   | Pulmonary stress testing; simple (eg, 6-minute walk test, prolonged exercise test for bronchospasm with pre- and postspirometry and oximetry)                                                                                  |
| 94664                   | Demonstration and/or evaluation of patient utilization of an aerosol generator, nebulizer, metered-dose inhaler, or IPPB device                                                                                                 |
Office or other outpatient visit for the evaluation and management of an established patient that may not require the presence of a physician. Usually, the presenting problem(s) are minimal. Typically, 5 minutes are spent performing or supervising these services.

COPD, chronic obstructive pulmonary disease; CPT, current procedural terminology; IPPB, intermittent positive-pressure breathing.

*Sample spirometry-related codes; comprehensive CPT code lists should be consulted in clinical practice.

<table>
<thead>
<tr>
<th>Code*</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>305.1</td>
<td>Tobacco use disorder</td>
</tr>
<tr>
<td>490</td>
<td>Bronchitis</td>
</tr>
<tr>
<td>491</td>
<td>Chronic bronchitis</td>
</tr>
<tr>
<td>491.21</td>
<td>COPD with acute exacerbation</td>
</tr>
<tr>
<td>492</td>
<td>Emphysema</td>
</tr>
<tr>
<td>496</td>
<td>Chronic airway obstruction not elsewhere classified</td>
</tr>
<tr>
<td>786.0</td>
<td>Dyspnea</td>
</tr>
<tr>
<td>786.05</td>
<td>Shortness of breath</td>
</tr>
<tr>
<td>786.07</td>
<td>Wheezing</td>
</tr>
<tr>
<td>786.2</td>
<td>Cough</td>
</tr>
</tbody>
</table>


*Sample ICD-9-CM codes related to COPD; comprehensive ICD-9-CM code lists should be consulted in clinical practice.